2.3 CCLME – Coastal Pelagics: Ecosystem Science From Coastal Pelagic Surveys and Habitat Modeling

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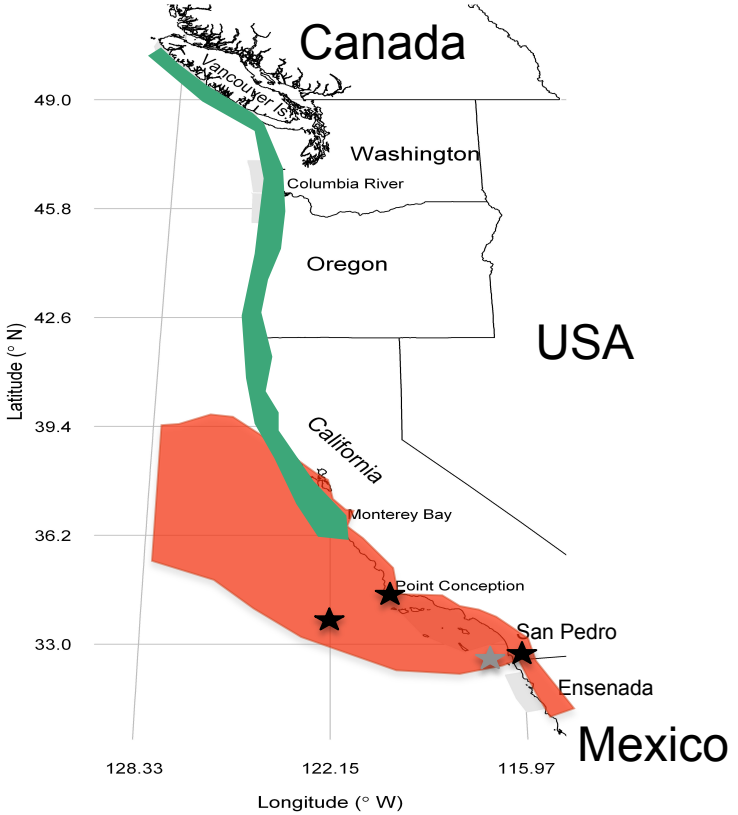
NOAA FISHERIES
SWFSC

TOR Question:

Q1, Q2, Q6

Pacific Sardine

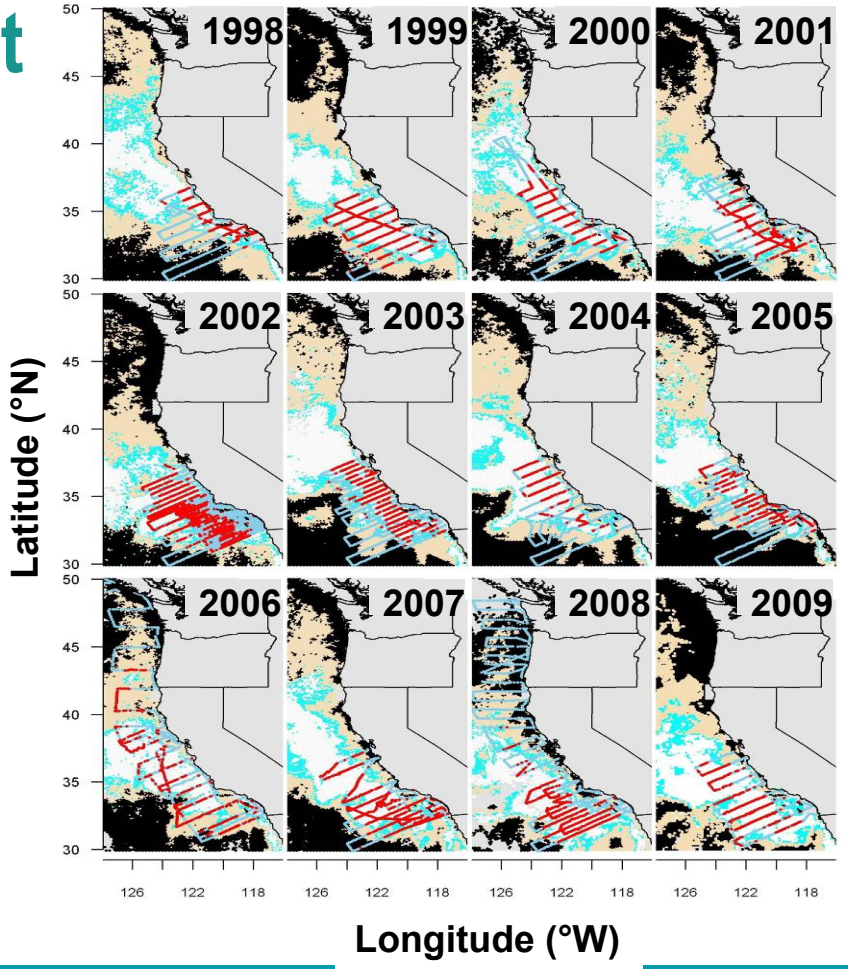
- **Northern stock spans three countries**
- **Migrates seasonally**
  - **Spring** – Mexico to Central California
  - **Summer** – Central CA to Canada
- **Six Regional Fisheries**
- Seasonal
  - Vancouver Island, Canada
  - Washington, USA
  - Oregon, USA
- Continuous
  - Monterey, California, USA
  - San Pedro, California, USA
  - Ensenada, Mexico
- **Characterize Potential Habitat**
  - Ship-based Surveys
  - Population Assessments
  - Ecosystem Analyses



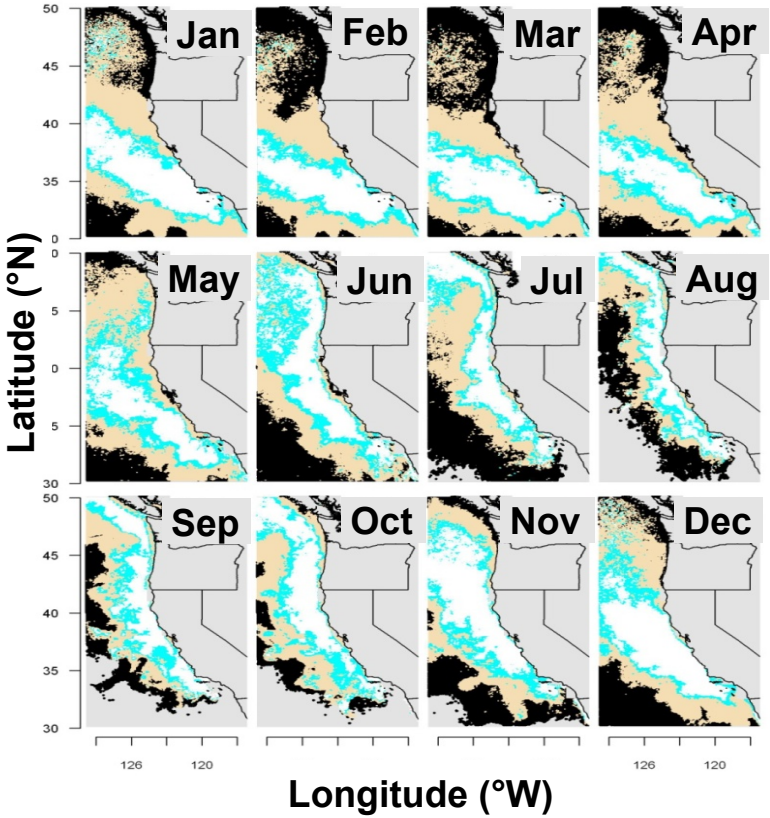
Potential Sardine Habitat

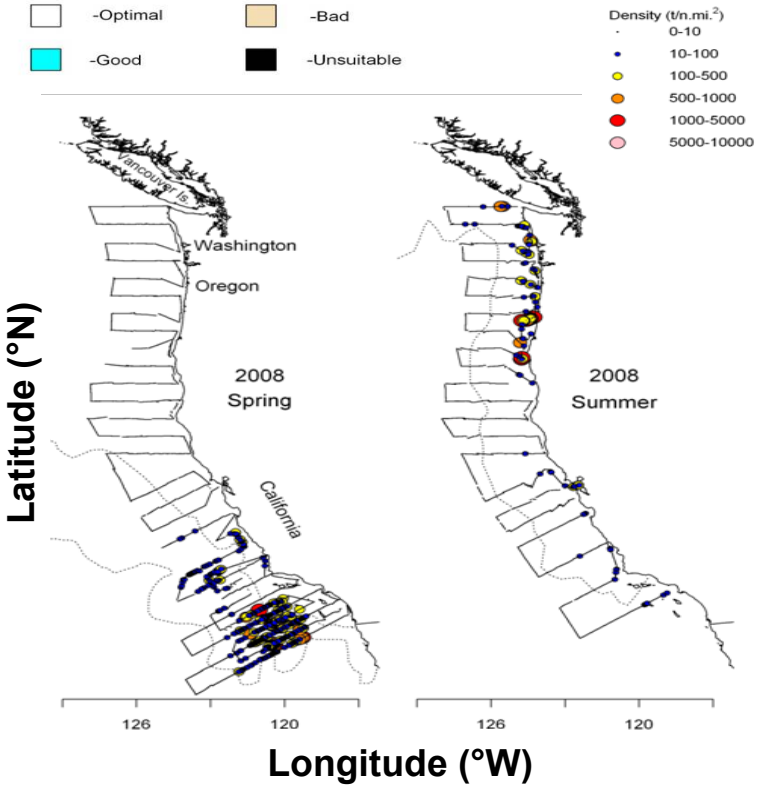
- 12 years of CUFES Surveys
  - 1998-2009
  - Sardine egg samples (red)
- 90% within optimal+good habitat
  - $11.5 \leq SST \leq 15.5$ °C &
  - $0.18 \leq CHL \leq 3.2$ mg/m^3
- Between oligotrophic oceanic and freshly upwelled waters
- Habitat utilization is density dependent

J.P. Zwolinski, R.L. Emmett, and D.A. Demer, 2011, "Predicting habitat to optimize sampling of Pacific sardine (*Sardinops sagax*). *ICES Journal of Marine Science*, 68: 867–879.



Seasonal Migration and Habitat

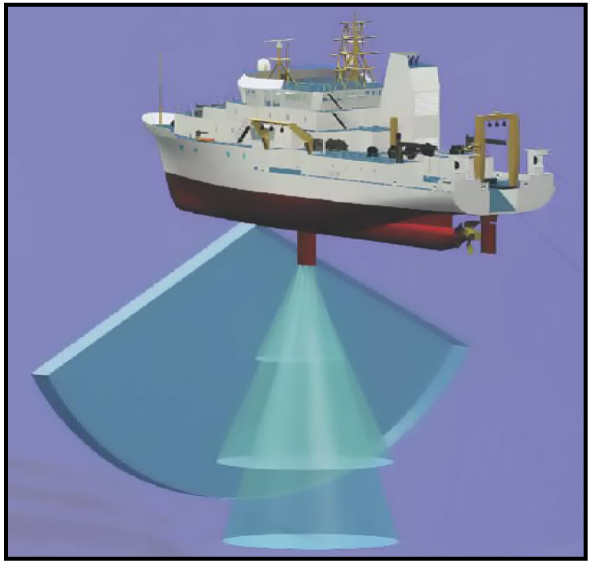


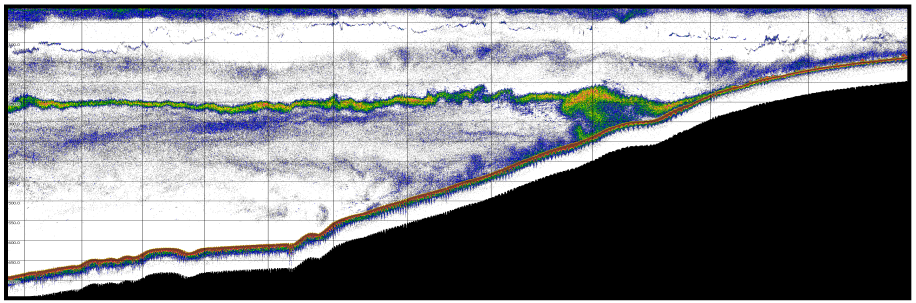


D.A. Demer, J.P. Zwolinski, K.A. Byers, G.R. Cutter, J.S. Renfree, T.S. Sessions, B.J. Macewicz, 2012, "Prediction and confirmation of seasonal migration of Pacific sardine (*Sardinops sagax*) in the California Current Ecosystem," *Fisheries Bulletin*, 110:52-70.

Acoustic-Trawl Sampling

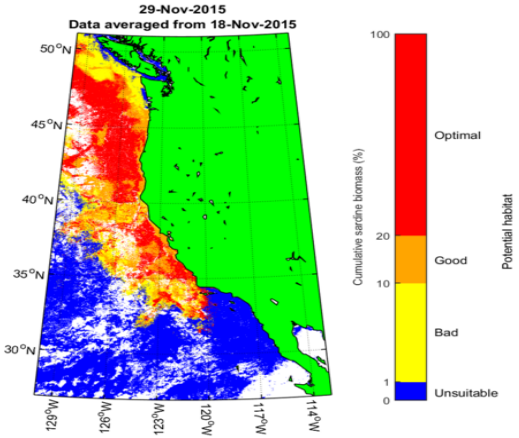
- **Acoustic sampling**
  - Five frequency Simrad EK60s
  - Optimized sampling
    - Range, to 750 m
    - Optimized transmit interval
    - Avoidance of aliased seabed echoes
- **Trawl sampling**
  - Mid-water during day
  - Surface during night



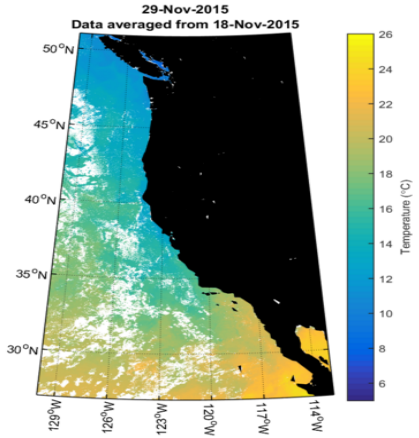


Adaptive Sampling using Potential Habitat

Potential Sardine Habitat

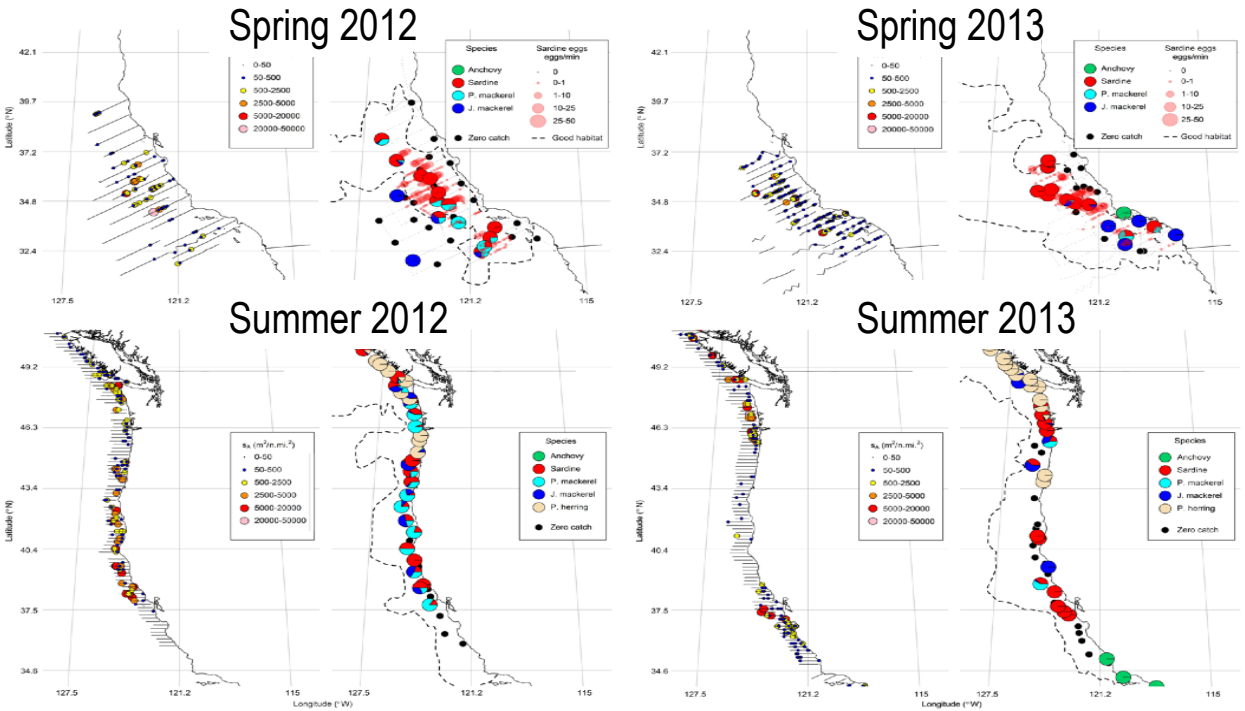


Sea Surface Temperature



http://swfscdata.nmfs.noaa.gov/AST/sardineHabitat/habitat.asp

Multi-Species Acoustic-Trawl Surveys



Zwolinski, J.P., D.A. Demer, G.R. Cutter Jr., K. Stierhoff, and B.J. Macewicz. 2014. Building on fisheries acoustics for marine ecosystem surveys. Oceanography 27(4):68–79, http://dx.doi.org/10.5670/oceanog.2014.87.

Coastal Pelagic Research

Strengths

- Congruence between potential habitat model and distribution of sardine
- Adaptive sampling framework developed and implemented
- Active website forecasting potential sardine habitat
- External reviews conducted
- Personnel

Challenges

- Timely processing of data
- Transitioning from EK60 to EK80 – calibration
- Developing habitat models for other CPS given the paucity of data, sampling limitations and current resources
- Staffing cruises
- Lack of sampling in Mexican waters

Strategies

- Efforts are underway to partner with Mexico on joint surveys
- Research plan developed to calibrate EK60 and EK80 in 2016
- Develop a cooperative research program with industry to sample inshore areas


Questions